CLAIMS

What is claimed is:

1. A system for replicating resist patterns with high accuracy, comprising:

a carrier having a plurality of workpieces mounted thereto with a bonding material ; and

a stamp for accommodating co-planarity variations between the workpieces including a step height and a tilt angle, the stamp being formed from a laminate of materials comprising a polymer layer, a pad adjacent to the workpieces, and a glass layer located between the polymer layer and the pad.

2. The system of claim 1, wherein the stamp is a transparent, bendable, UV-stable, conformal stamp.

3. The system of claim 1, wherein the pad is a poly-dimethylsiloxane sticky pad.

4. The system of claim 1, wherein the glass layer has a thickness in a range of approximately 25 to 250 microns.

5. The system of claim 1, wherein the polymer layer has a thickness in a range of approximately 25 to 250 microns.

6. The system of claim 1, wherein the pad has a thickness in a range of approximately 5 to 1000 microns.

7. The system of claim 1, wherein adjacent ones of the workpieces are spaced apart from each other by approximately 30 to 1000 microns.

8. The system of claim 1, wherein a maximum value of the step height that can be accommodated by the stamp is up to approximately 20 microns.

9. The system of claim 1, wherein a maximum value of the tilt angle that can be accommodated by the stamp is up to approximately 2 degrees.

10. The system of claim 1, wherein the workpieces are coated with a pre-polymer, and wherein the system further comprises an initial ash process for removing a layer of resist on the workpieces.

11. The system of claim 10, further comprising grooves formed in the pad to facilitate removal of the pre-polymer.

12. The system of claim 11, wherein the grooves comprise a series of rectangular ridges that are symmetrically spaced apart from each other.

13. The system of claim 1, wherein the bonding material comprises a bonding pad having flat elastomeric sticky protrusions separated by drainage channels that allow the workpieces to be placed thereon at high speed.

14. The system of claim 13, wherein the workpieces are placed on the bonding pad at a vertical speed of approximately 10 mm/s, the elastomeric protrusions are approximately 20 microns in width, and the drainage channels are approximately 5 microns in width and depth.

15. The system of claim 13, wherein the bonding pad is formed from a siloxane rubber, such as poly-dimethylsiloxane.

16. The system of claim 13, wherein the flat elastomeric sticky protrusions are enhanced with a surface activation.

17. The system of claim 13, wherein the bonding material further comprises a backplane located between the carrier and the bonding pad for preventing lateral and vertical distortions of the bonding pad, and the backplane is flat, laterally stiff, and bendable, and is formed from a material selected from the group consisting of glass, metal, silicon, and polymer.

18. A method of processing workpieces, comprising:

(a) assembling the workpieces onto a sticky pad;

(b) bonding the workpieces to a carrier;

(c) removing the sticky pad from the workpieces;

(d) applying a layer of UV-curable material to the workpieces;

(e) pressing a patterned stamp onto surfaces of the workpieces to form patterns having at least first and second lithographic layers;

(f) UV-curing the patterns on the workpieces;

(g) removing any excess UV-curable material from the workpieces;

(h) processing the first lithographic layer;

(i) removing any excess UV-curable material from the first lithographic layer to expose the second lithographic layer;

(j) processing the second lithographic layer;

(k) removing any excess UV-curable material from the second lithographic layer; and then

(l) debonding the workpieces from the carrier.

19. The method of claim 18, wherein step (a) further comprises patterning the sticky pad with channels and allowing air to escape through the channels as the workpieces are assembled to the sticky pad.

20. The method of claim 19, wherein step (a) comprises making the channels elongated at approximately 5 microns wide and approximately 5 microns deep.

21. The method of claim 18, wherein step (a) comprises providing the sticky pad as an elastomeric rubber pad.

22. The method of claim 18, wherein step (b) comprises bonding the workpieces to the carrier by UV exposure and cure of an acrylate adhesive on the carrier.

23. The method of claim 18, wherein step (b) comprises bonding the workpieces to the carrier with a thermoplastic material.

24. The method of claim 18, wherein step (c) comprises peeling the sticky pad from the workpieces.

25. The method of claim 18, wherein step (d) comprises applying the layer of UV-curable material to the workpieces by a method selected from the group consisting of spray coating, pipetting, and roller coating.

26. The method of claim 18, wherein steps (g), (i), and (k) comprise a selective oxygen ash that only removes polymer, but not ceramic.

27. The method of claim 18, wherein steps (h) and (j) comprise ion milling the lithographic layers.

28. A method of processing workpieces, comprising:

(a) providing a sticky pad with patterns having at least first and second lithographic layers;

(b) applying a layer of UV-curable material to the sticky pad to fill the patterns;

(c) assembling the workpieces onto the sticky pad;

(d) curing the UV-curable material on the workpieces while the workpieces are in contact with the sticky pad;

(e) transferring the workpiece to a carrier to process the sliders;

(f) removing any excess UV-curable material from the workpieces;

(g) processing the first lithographic layer;

(h) removing any excess UV-curable material from the first lithographic layer to expose the second lithographic layer;

(i) processing the second lithographic layer;

(j) removing any excess UV-curable material from the second lithographic layer; and then

(k) debonding the workpieces from the carrier.

29. The method of claim 28, wherein step (a) further comprises patterning the sticky pad with channels, and step (c) comprises allowing air and excess pre-polymer to escape through the channels as the workpieces are assembled to the sticky pad.

30. The method of claim 29, wherein step (a) comprises making the channels approximately 2 microns wide, approximately 500 nm deep, and approximately 20 microns apart.

31. The method of claim 28, wherein step (b) comprises doctor blading the layer onto the sticky pad to fill all recessed zones while leaving a topmost surface free from the layer.

32. The method of claim 28, further comprising, after step (b), applying an additional amount of UV-curable material to the sticky pad to allow reliable contact between the UV-curable material and the workpieces.

33. The method of claim 32, further comprising spray coating the additional amount of UV-curable material to the sticky pad.

34. The method of claim 28, further comprising viewing the workpieces through the sticky pad and the layer.

35. The method of claim 28, wherein step (a) comprises providing the sticky pad as an elastomeric rubber pad.

36. The method of claim 28, wherein step (c) comprises bonding the workpieces to the carrier by UV exposure and cure of an acrylate adhesive on the carrier.

37. The method of claim 28, wherein step (c) comprises bonding the workpieces to the carrier with a thermoplastic material.

38. The method of claim 28, wherein step (e) comprises peeling the sticky pad from the workpieces.

39. The method of claim 28, wherein steps (f), (h), and (j) comprise a selective oxygen ash that only removes polymer, but not ceramic.

40. The method of claim 28, wherein steps (h) and (j) comprise ion milling the lithographic layers.